DOCUMENT RESUME

ED 104 074 EC 071 933

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|---|---|
| AUTHOR | White, Owen R. |
| TITLE | The Functional Development of Retarded Behavior. Working Paper No. 28. |
| INSTITUTION | Oregon Univ., Eugene. Rehabilitation Research and Training Center in Mental Retardation. |
| PUB DATE | Apr 69 |
| NOTE | 23p. |
| EDRS PRICE | MF-$0.76 HC-$1.58 PLUS POSTAGE |
| DESCRIPTORS | *Behavior Theories; Child Development; *Classification; Conceptual Schemes; Etiology; Exceptional Child Education; Identification; *Mentally Handicapped; *Models; Reinforcement; Stimulus Behavior; Time Factors (Learning) |
| IDENTIFIERS | *Labeling |

ABSTRACT

The author uses a behavioral model to discuss probable and demonstrable conditions through which retardation might develop. Noted are criteria for etiological classification and explained are four reasons why terms such as cultural deprivation should not be used to label mentally retarded individuals. The need to consider developmental retardation as an observable phenomena subject to objective analytical techniques is stressed. The major portion of the document focuses on retardation as a function of response deficiency, of inadequate reinforcement history, and of stimulus deficiencies. Also explored is the concept of 'critical periods' from a behavioral standpoint. (LS)

ED104074

U.S. DEPARTMENT OF HEALTH
EDUCATION & WELFARE
NATIONAL INSTITUTE OF
EDUCATION

College of Education
Center on Human Development

# Rehabilitation Research and Training Center in Mental Retardation

University of Oregon, Eugene

EC071933

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ED104071

WORKING PAPER NO. 28

# THE FUNCTIONAL DEVELOPMENT OF RETARDED BEHAVIOR

Owen R. White
April, 1969

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# THE FUNCTIONAL DEVELOPMENT

# OF

# RETARDED BEHAVIOR

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When one speaks of causation, one refers to a relationship between the occurrence of one set of circumstances and the subsequent occurrence of another set of circumstances. Statements of causation may be represented logically to read: "If event A occurs, it will lead to the occurrence of event B." In fact, however, this relationship is rarely perfect (i.e., where A will always be followed by B; and B will always be preceded by A).

First, it may be that A will lead to B if and only if other variables do not enter in. For example: Rain will always wet the ground if and only if the ground is not protected by a cover. This is not to refute the statement that rain may cause the ground to be wet--only that every time it rains we can only be certain of the outcome if we are aware of the other intervening variables and their effect.

Second, it may be the case that while A may lead to B, B may also result from a third variable, C. For example: Rain may cause the ground to be wet, but the ground may also become wet as a result of artificial means such as watering the lawn, flooding, or heavy dew.

Third, it may be the case that both A and B are caused by a third variable. For example: Both rain and wet grounds are determined by the presence or absence of moisture, which in turn is determined by air currents, the proximity of larger bodies of water, the topography of the landscape between the water soruce and the region in question, and so on.

To be correctly interpreted an etiological statement must be viewed with each of these qualifications in mind.

In the bio-medical sense a statement of causation correctly phrased might read: One of the causes of severe mental retardation is cretinism; which can appear as a result of faulty development of the thyroid gland, which can be due to an iodine deficiency in the mother during pregnancy; which can be caused by diet. The social scientist is likely to add that diet can be determined by the giographic region; which can be determined by level of income; which can be determined by family background; which can be determined by national origin. At each of these levels of "causation" there would be many other variables which, in the interest of brevity, have been omitted.

In order for an etiological classification to be of any use it must a) provide specific direction for further research, b) provide specific suggestion for effective remediation or treatment of the problem once existent, or c) provide specific direction for effective means of preventing the continued occurrence of the problem. The above classification, cretinism, deliniated as it is, does meet these criteria, as do the greater portion of medical classifications with respect to specific etiology.

The vast majority of mentally retarded individuals, however, cannot be classed with respect to any specific bio-medical syndrome (Robinson and Robinson, 1965). For the categorization of these people, and for the explanation of differences between members of a bio-medical category, people frequently hypothesize psychological causation. Level of intellect, cultural deprivation, and emotional disturbance are examples of terms put to this purpose. The use of these labels for etiological purposes is, however, inadvisable for a number of reasons (Heber, 1961; Kauppi, 1968).

First, labels such as those cited are really little more than loose categories describing a group of people whose backgrounds and behaviors correlate crudely at best. A culturally deprived child, for example, may be institutionalized, from a ghetto with English-speaking parents or non-English-speaking parents; with a father who is dead, or doesn't work; with or without a mother; or an orphan; etc., etc. Given that it would be difficult to identify all the variables in such a classification, it would be nearly impossible to deal with them as a group from a research or treatment point of view. The classification is, therefore, simply not discreet enough to meet the criterion of a valid and useful etiological category without further deliniation.

Second, the majority of psychological categories make reference to hypothetical constructs which are not directly observable. Intellect, for example, must be inferred from the behaviors of the subject during a standard testing situation. While it has proven somewhat useful to classify individuals with respect to IQ level for predictive purposes, it is all too often the case that IQ is treated as a "noun" to describe a specific and unique class of individuals--which at best is a gross over-simplification. Such usage can only serve to limit the more detailed investigation and transcription of the observable phenomena (behavior), and cannot help in the treatment or remediation of the problem (Bijou, 1966).

Third, more frequently than not the onset of the specific psychological anomaly and the associated retardation occur in such close temporal proximity (usually during infancy) that it is virtually impossible to determine which occured first. 'Did the retardation result from the emotional disturbance, or did the child become emotionally disturbed because of the pressures of being retarded?" In fact, both conditions may have been caused by a third

Fourth, the use of psychological classifications with respect to cause or degree of retardation has proven to be useful only on the grossest of levels, and quite ineffective in distinguishing between retarded individuals discreetly enough for consistently appropriate placement in treatment programs (Kauppi and Weiss, 1968). The heterogeny of the behavioral characteristics for mentally retarded (or normal) persons simply cannot be reflected in a unidimensional medical or psychological classification (Heber, 1961).

With knowledge of these points it is obvious that a complex, multi-dimensional scheme of classification need be developed which fully records the parameters of behavior found important for predictive and treatment purposes (Heber, 1966). In an attempt to do just that it has been suggested (Bijou, 1966) that retardation be treated as an observable, objectively defined system of stimulus-response relationships between the organism and his environment. It has been demonstrated through numerous studies (Friedlander, 1967; Lindsley, 1964; Birmbrauer, 1966; Hubschman, 1967; Barrett and Lindsley, 1962; Baumeister, 1967; Ferguson, 1967; and others) that behaviors often labeled as "retarded" can be shaped (created), controlled, or eliminated through analysis and programming under such a system (Skinner, 1953, 1964). Whether retarded behaviors were in fact caused by similar functional relationships in the past which existed prior to formal analysis in any single case is secondary to the success with which the system allows prediction, treatment, and remediation. Studies are now being performed concerning the system's predictive value (Heber, in progress).

The system which will be described within the remainder of this paper applies equally well to the analysis of normal or retarded development (Bijou and Baer, 1961 and 1965). In this paradigm the individual is considered

a set of responses and response systems. The individual may effect the environment through responding (physical manipulation) or as a source of stimulation (Skinner, 1964).

The environment is taken as the set of effective (noticable) stimuli from social and physical events outside the body, and from biological events within the body itself. Psychological development is considered the progressive change in the form of the interaction between the individual and the environment (Bijou, 1966).

A "normal" individual is one for whom the type and nature of environmental interaction has lead to the development of acceptable behaviors. A retarded individual is one whose history of interaction has lead to the development of a noticeably limited repetoire of effective and acceptable behaviors.

The types of behavior which hold the greatest relevance to the distinction between normal and retarded individuals are called operants--so termed because they are most responsible for the manner in which an organism manipulates his environment. Operants derive their form and frequency of occurance from their effectiveness in procuring for the organism desirable changed in the environment. An operant is, then, any behavior which is controlled by its consequences or events which occur subsequent to its emission.

Events which strengthn the form of an operant or increase the frequency of its emission are called reinforcers. In the absence of reinforcement an operant will weaken, change in form, and eventually fail to be emitted by the organism.

Because the specific form of an operant is determined through its interaction with the environment we speak of that form of the behavior as being a response (to environmental events which comprise the history of the

organism). Hereafter, therefore, we shall speak of "responses" and "behaviors" (the latter generally used to describe relatively large classes or chains of more discreet responses).

Events which occur prior to the emission of a response to "cue" the organism as to which response will or will not be effective in procuring reinforcement are called discriminative stimuli. While these antecedent events may control when a response will be emitted, they gain that power only through repeated association with the reinforcing events occurring after the emission of the response. Because of the necessity of this association stimulus "control" does not violate the basic tenet that operants are controlled by their subsequents.

Since responses vary slightly in form with each new emission (due to changes in physiological and environmental variables) it is possible to reinforce only those variations which more closely approximate a new, presently "unemitted", response and institute it into the repertoire of the organism.

In the remainder of this chapter a number of examples are discussed of how these principles could be used (or misused) to shape retarded behavior.

Retardation as a Function of Response Deficiency

If an organism is incapable of responding in a manner which will produce reinforcement from the environment, then by definition the organism will go unreinforced. Since operant behavior is generated and maintained by reinforcement, then it follows that an unreinforced individual will exhibit an extremely low level of operant activity. This is not to say that

the subject would necessarily cease all activity (although this may be the case, as in the catatonic schizophrenic), but his activities would probably be limited to those which produced some sort of "self" stimulation (e.g., masterbation, rocking, etc.) or behaviors that were so drastic as to force some interaction with the environment (e.g., tantrums, screaming, head-banging, etc.). The expected results of nonreinforcement correlate well with the observed phenomena (Bijou, 1966; Lindsley, 1964).

Individuals might become debilitated with respect to the necessary repertoire of responses through two basic means. First, through birth defect or later trauma which make the responses physically impossible; and, secondly, through a lack of opportunity to develop the responses at a reasonable pace with adequate reinforcement of all successive approximations.

In any instance where an individual is forced into a situation where a completely new set of behaviors is required to obtain reinforcement; and where he is expected to emit those behaviors fully intact without a period in which successive approximations are reinforced, we can only expect "retarded" (if any) development.

Children who are sick during the period when most basic athletic skills are formed will probably never develop them; children raised in a ghetto where academics are frowned upon will probably never be scholars; etc. This is not to say that they cannot develop these skills; only that by the time the opportunity is made available they are too far behind to gain reinforcement for the initial steps in the natural progression of events. In this regard Lindsley (1964) stated, "Children are not retarded, it's only that their behavior is sometimes retarded in certain environments; or, our ability to train the child appropriately is retarded."

The obvious step for the remediation of response deficiencies lies in the analysis of the child's present repertoire and the programming of the environment to reinforce successive approximations to behaviors which will enable the child to procure reinforcement in a more natural manner. In cases of severe retardation or physical debility this might include permanent prosthetic alterations within the environment which compensate for the response losses.

Retardation as a Function of Inadequate Reinforcement History

In the previous section the effects of nonreinforcement as a function of response deficiency were discussed. There are many ways, however, in which the inappropriate use or nonuse of reinforcement can result in retarded behavior.

First, regardless of the response repertoire of the child it may be the case that reinforcement is not delivered. A child who is physically unattractive, for example, may hold such an aversion to peers and adults that they avoid him (consequently, do not reinforce him). The responses are intact, and the reinforcers available, but the reinforcing "agent" too infrequently present. This condition might also obtain in a situation where a child is left to his own devices while the parents work, or perhaps when the child is deliberately removed from the normal environment as in the case with institutionalization in an undermanned facility, or in the rare but dramatic "attic" cases.

Still another possibility is the removal of the prime reinforcing agent, as through death or separation of a parent or close friend from whom the majority of reinforcement was received. In any of these cases we would

expect deterioration of previously acquired behaviors and the failure for new (appropriate) behaviors to develop (Lindsley, 1964; Terrace, 1966).

Secondly, it is possible that even though reinforcement was adequate and appropriately delivered during the initial stages of the developing behavior, the reinforcement was "leaned-out" too rapidly. Situations might include a previously attentive parent who is forced back to work after the child is five or six years old (but still in a stage of rapid development and, therefore, in need of large amounts of reinforcement); or simply where a parent becomes impatient for a behavior to be fully instated and terminates reinforcement for it as soon as it reaches an acceptable level (thereby placing it on extinction, eventually leading to its deterioration). Deterioration might lead to further impatience, punishment and other aversive controls, less positive reinforcement, etc.

Third, it may be possible that reinforcement is delivered frequently but in a noncontingent manner. Take, for example, a case in which a child has become the object of sympathy due to sickness or physical anomaly, and the family "over-reacts" to the situation by comforting and praising any and <u>all</u> behaviors indiscriminately. Because no particular behavior receives more reinforcement than any other we could not expect any single behavior to predominate in strength or frequency. The result would be high levels of activity but retarded development with respect to the formation of specific and useful skills. Lindsley (1964) noted that many retarded individuals live in this type of environment; and when reinforcement is made contingent upon the development of specific skills in a programmed manner (but without increasing or decreasing the actual rein-

forcement density), then adequate development begins to take place. Hernstein (1966) observed the same results in more controlled studies at the infrahuman level.

Fourth, it is possible that reinforcement is actually made contingent upon aversive, "retarded" behaviors. It was mentioned before that in the absence of reinforcement an organism may attempt behaviors which are so drastic as to force interaction with the environment. A mother may ignore her child, for example, until the child cries. When crying reaches a particularly annoying state, the mother is likely to pick the child up in an attempt to terminate the behavior. The mother is reinforced for picking the child up by stopping the crying, but the child is reinforced for the crying. Tantrums, head-banging, and other particularly disruptive behaviors are often reinforced in this manner (Sidman, 1966). If this is the only manner in which the child is assured of reinforcement, the deviant behavior may become so strong as to dominate the child's entire repertoire. In such a case the result would be retarded development. (Bijou, 1966; Ferster and Perrott, 1968).

Fifth, it may be the case that reinforcement is delivered frequently and is made contingent upon the development of specific and useful behaviors, but it is too delayed in presentation to be effective.

Generally speaking, reinforcement will reinforce whatever event just precedes its occurrence--whether or not there was any causal relationship (contingency). In order for reinforcement to be maximally effective, therefore, it must be delivered as soon as the desired behavior is emitted. Although this is not always possible, the gap between the behavior and the ultimate reinforcer is usually bridged by what is called a "conditioned"

reinforcer. Conditioned reinforcers gain effectiveness in controlling behavior by having been paired (presented simultaneously) with more primary reinforcers in the past. Once this association is formed the delivery of the primary reinforcer may be delayed for large intervals of time without ill effects on the generation or maintenance of the behaviors followed by the conditioned reinforcer. Conditioned reinforcers may include social praise, money, the simple occurrence of an event such as a light flashing or a bell ringing, or even the response itself (if reinforcement had consistently been paired with that response in the past). Conditioned reinforcers can, in fact, be created from any noticeable environmental event.

Without conditioned reinforcers we could not expect an individual to make the association between his behavior and the subsequent (delayed) delivery of the primary reinforcer. At best, this would result in a situation similar to that discussed above under "noncontingent" reinforcement; that is, responding would occur, but in a random, unpredictable fashion. Lindsley (1964) observed this phenomena in a study of delayed reinforcement with retarded children. Remediation of the problem would amount to a restructuring of the environment to provide consistent pairing of primary reinforcement with more natural stimulus events (praise, task completion, etc.) until the chosen events gain reinforcing properties.

Finally, retarded behavior might be a function of excessive punishment or aversive stimulation. While punishment has been demonstrated to be effective in the reduction of behavior, further studies (Azrin and Holz, 1966) indicate that if the punishing stimulus is not extremely severe, the behavior has a high probability of returning. In addition to being of questionable stability, punishment also has the property of generating avoidance behaviors

(behaviors which remove the organism from the punishing environment). If the punishing agent (e.g., the parent) is paired too frequently with the aversive situation, the child will try to avoid or escape his presence. Such a situation leads to loss of control altogether. If the parent represented the child's primary source of behavioral education (or if the aversive qualities of the parent had generalized to the class of all adults), then the child would essentially be in a state of nonreinforcement, the effects of which have been discussed above. In cases of extreme punishment the child might become neurotic or psychotic (e.g., autistic, catatonic, etc.). Cases to demonstrate these points have been cited by Bijou (1966), Azrin and Holz (1966), and Lindsley (1964).

This is not to say that punishment should never be used or will never be effective, only that it should not be used exclusively (i.e., in an environment where no positive reinforcers are available) or indiscriminately (the child should always be aware of the reason for punishment, and those reasons should be consistent and invarient).

Effective, contingent, and frequent reinforcement is the basis of all operant behavior. Retarded development should first be viewed with respect to this parameter of environmental interaction. After detailed and careful analysis the appropriate remedial program should be apparent to eliminate or minimize the behaviors which result in the label "retardation" (Bijou, 1966).

Retardation as a Function of Stimulus Deficiencies

In previous sections the effects of response and reinforcement deficiencies were discussed. Even when the response is intact and reinforcement is available, however, the organism may not be able to determine when to emit a response for reinforcement; or, given that the organism knows that

a response is required, he may not be able to determine which of a number of behaviors is appropriate. Deficiencies of this nature arise from the stimulus component of the behavioral equation (Bijou, 1966).

Environmental events which allow the organism to determine when to emit a response are called discriminative stimuli, and are formally defined as stimuli in the presence of which the emission of a specified operant, class of operants, or chain of operants will (eventually) be reinforced (by positive or aversive contingencies), and in the absence of which the availability of reinforcement is indeterminable. An effective discriminative stimulus (one recognized as such by the organism) will produce highly predictable rates or probabilities of responding in its absence. Stimuli gain these properties through consistent and prolonged pairing with a specific reinforcement contingency (White, 1969).

If a child is not exposed to these stimuli (due to physical limitations such as blindness or confinement to bed), or if they are not consistently paired with the same reinforcement contingency, then two patterns of behavior might develop: First, the behavior may be emitted in a random, unpredictable manner in the attempt of the organism to find that behavior which will procure reinforcement; or, second, the behavior may "perseverate" in a form which was effective at some previous moment, but no longer is.

Lindsley (1964) demonstrated with a group of retarded children that "perseveration" was, in fact, due to a lack of stimulus control; and that the subjects had the appropriate response in their behavioral repertoires but were simply unable to determine when a change in the environment required a change in responding. Specific training ameliorated this deficit in all

subjects and eliminated it in some. After training the majority of subjects were able to learn visual discriminations faster than normals of the same MA or CA (Lindsley, 1964; Barrett and Lindsley, 1962).

Stimulus deficiencies are not, therefore, irreversible but only require specific and consistent training (Baumeister, 1967; Lunzer, 1967) and experience with a variety of stimulus situations (Terrace, 1966).

The importance of stimulus control is most relevant to the formation of social and concept-formation skills (Skinner, 1953) and cannot be over-emphasized. If an organism cannot determine what to do or when, then development can only be "retarded".

"Critical Periods" From a Behavioral Standpoint

The notion that timing is critical in a learning situation has been held for a number of years (Harlow, 1961, 1963; Bowlby, 1952; Lorens, 1937). The same idea was touched upon earlier in this paper in the sections on response and reinforcement deficiencies. In the past the feeling has been that there are periods during which specific types of training or education must take place to be effective (Bowlby, 1952; Lorenz, 1937). More recent investigations indicate that behaviors learned during these "critical periods" are not irreversible (Moltz, 1960), but are certainly strong and persistent (Hess, 1959).

The theory that behaviors developed during critical periods could owe their strength to unusual reinforcement conditions was first proposed by Gewirtz (1961). Recently Scott (1969) performed studies at the infrahuman level which implicate the role of restricted stimulus conditions as well. In addition to these studies a number of analytical projections may be drawn from the system with which we are working.

First, it is known (Terrace, 1966) that an organism raised in an environment devoid of specific types of stimuli will exhibit marked deficiencies in the use of these stimuli for discriminative purposes later in life. Careful training and experience can, however, ameliorate these deficiencies.

Furthermore, if an organism is raised in one environment and then placed in another with little or no similarity to he first, then all stimulus conditions previously associated with reinforcement will be lacking. In such a situation one could only expect a general lowering of activity level and the emission of escape behaviors. These behaviors have been observed to obtain (Scott, 1969), but not to be irreversible if appropriate shaping techniques are utilized.

Another possible determinant of seemingly "fixed" behaviors might lie in shaping or programming which remains at one level of development for a longer than necessary period of time. Such a program would have reinforced behaviors for not changing when they should have. Before the behavior may be altered, therefore, the previous history of reinforcement for that behavior must be overcome (e.g., as through extinction).

Since the degree to which a reinforcement contingency will control behavior is dependent upon the proportion of the total history of reinforcement that it represents (and, to a smaller degree, the recency), then it follows that the later a contingency change is instituted, the longer it must be in effect before it reaches equivalent proportions to previous contingencies in the history; and, subsequently, to control the behavior

of the organism. This would lead to the conclusion that behaviors might be most easily shaped in the early stages of development, but not that they cannot be shaped later in a proportionately equal length of time.

On the basis of these analytical projections one might conclude that the rigidity of behavior formed in the "critical periods" of life might be alleviated or avoided by careful programming which minimizes the possibility that any one stimulus setting, reinforcer, or reinforcing agent predominates the majority of the subject's developing history. The balance between consistency and flexibility, while seemingly paradoxically opposed, is possible (Skinner, 1938).

## Summary

This chapter has dealt with developmental retardation as an observable phenomena subject to objective analytical techniques. Utilizing the behavioral model (Skinner, 1938), probable and demonstrable conditions through which retardation might develop have been discussed. It is the author's opinion that this model, or an extension of it, is the only effective means by which all observable retarded behavior may be analyzed and treated.

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